Sustainability Development Report (2023-24)

SDG 9: Industry, Innovation and Infrastructure

Executive Summary

The Institute of Engineering and Management (IEM), Kolkata, made significant strides toward SDG 9 in 2023-24 by developing resilient infrastructure, promoting inclusive industrialization, and fostering innovation through 23 Centers of Excellence, 14 Innovation and Entrepreneurship Development Centres, and 15,000 square meters of advanced research facilities, supporting 198 startups with Rs. 289.5 lakhs in seed funding, generating 1220 research publications, filing 112 patents, and securing Rs. 43.8 crore in external grants via 25 MoUs that enabled 2,809 joint activities and 4,948 student internships. Enhanced ICT infrastructure included 3,202 computer systems, 3.4 Gbps internet, and digital libraries with 8,45,000 volumes, complemented by sustainable initiatives like 40 kW solar capacity, rainwater harvesting, sewage treatment, and 2,169.90 kg e-waste recycling, while PhD programs supported 124 scholars under 176 guides through 67 workshops, 43 FDPs, and 44 international conferences, yielding Rs. 43.8 crores in consultancy revenue and research funding with 35 research-based startups. Addressing challenges like technology obsolescence and funding dependency via internal seed funds, maintenance contracts, and diversified partnerships, IEM's roadmap targets 5 new Centers of Excellence, 198 startups, 1600+ publications, 150+ patents, Rs. 50 crores in grants, expanded solar capacity, 5 Gbps bandwidth, net-zero emissions, and long-term goals of supporting 2,000 startups with Rs. 100 crores in commercialization through global research networks.

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Overview and Context

The Institute of Engineering and Management (IEM), Kolkata, during 2023-24, advanced SDG 9 by building resilient infrastructure, promoting inclusive industrialization, and fostering innovation. With 23 Centers of Excellence and 14 Innovation and Entrepreneurship Development Centres, the institute supported 219 startups and generated 1220 scopus research publications and 112 patents. Research infrastructure was enhanced with Rs. 289.5 lakhs in seed funding and Rs. 43.88 crore in external grants. Faculty and PhD scholars actively contributed to research excellence. Industrial collaborations through 25 MoUs enabled 2,809 joint activities and provided internship opportunities to 4,948 students. Sustainable infrastructure initiatives included solar energy, rainwater harvesting, sewage treatment, and e-waste recycling, exemplifying IEM's commitment to technological advancement and sustainable growth.

Core Mandate

Develop resilient infrastructure and cutting-edge research facilities while nurturing innovation ecosystems that drive sustainable industrial growth and technological advancement.

Annual Targets

- Maintain 23+ Centers of Excellence and specialized laboratories
- Support 250+ innovative research projects annually
- Generate 1200+ publications and 112+ patents
- Establish 30+ industry collaborations with technology transfer
- Upgrade infrastructure with sustainable technologies

Key Initiatives and Programs

Research Infrastructure and Facilities

IEM established and maintained 23 Centers of Excellence and Specialized Laboratories providing state-of-the-art research infrastructure:

- IEM Institute of Fundamental Research for basic science investigations
- Center of Excellence for Innovation in Artificial Intelligence
- Astronomical Research Lab with Advanced Telescope facilities
- Advanced Materials and Nanotechnology Research Center
- IoT and Robotics Development Laboratory
- Renewable Energy and Sustainable Technology Center

- Biotechnology and Healthcare Engineering Lab
- Smart Infrastructure and Civil Engineering Research Facility

Infrastructure Specifications

- Total laboratory space: 15,000+ square meters
- Major equipment value: Rs. 25 crores
- Specialized instruments: 450+ advanced research tools
- Annual maintenance budget: Rs. 2.5 crores
- 24/7 access for doctoral and advanced research students

Innovation and Entrepreneurship Development Centres (IEDCs)

14 IEDCs supported the innovation ecosystem with comprehensive facilities:

- Co-working spaces for 200+ startup teams
- Prototyping facilities with 3D printers, CNC machines, and electronics workbenches
- Testing and validation equipment
- Business incubation support infrastructure
- Mentorship and training facilities
- Networking spaces for investor interactions

IEDC Impact Metrics

- Startups supported: 198 active ventures
- Seed funding disbursed: Rs. 289.5 lakhs
- Prototypes developed: 380+ product concepts
- Technology demonstrations: 125 showcase events
- Investor connections facilitated: 85 meetings

Central Instrumentation Facility (Upcoming)

Advanced characterization and analytical equipment shared across departments:

- X-Ray Diffraction (XRD) systems for crystallography
- Fourier Transform Infrared Spectroscopy (FTIR)
- High-Performance Liquid Chromatography (HPLC)
- Thermal analysis equipment (TGA, DSC, DTA1)
- Universal Testing Machines for mechanical characterization
- Precision measurement instruments

Information and Communication Technology Infrastructure

Computing Infrastructure

Comprehensive ICT facilities supporting academic and research activities:

- Computer systems: 3,202 units across all campuses
- Internet bandwidth: 3.4 GBPS dedicated connectivity
- Server infrastructure: High-performance computing clusters
- Cloud computing resources for data-intensive research
- Software licenses: MATLAB, COMSOL, Ansys, SolidWorks, AutoCAD
- Specialized software: LTSpice, Proteus, CST Studio, Cadence

Digital Learning Infrastructure

Technology-enabled learning environments:

- LCD projectors and screens: 158 units
- Smart boards: 4 interactive display systems
- Digital displays: 24 information TVs across campuses
- Audio systems: 130 sound systems, 196 microphones
- Online learning platforms: Google Classroom, Zoom, Microsoft Teams
- Virtual laboratory facilities for remote experimentation

Digital Library and Knowledge Resources

Extensive digital resources supporting research and learning:

- Physical books and e-books: 8,45,000 volumes
- IEEE Digital Library: 190 publications
- Springer journals: 222 titles
- EBSCO Business Source Elite: 1,064 journals
- J-Gate database: 29,306 journals
- DELNET and NDLI access for comprehensive coverage
- IEM Learning: 200 video lecture courses
- LinkedIn Learning: 18,000 courses
- NPTEL: 2,000+ courses
- Coursera: 5,000+ courses

Research Promotion and Innovation Ecosystem

Research and Development Cell (RDC)

Systematic research promotion through dedicated governance:

- Research policy formulation and implementation
- Seed grant evaluation and disbursement
- Research project monitoring and quality assurance
- Publication incentive administration
- Patent filing support and IP management
- Research infrastructure planning and upgradation

Seed Funding for Research Projects

Internal funding mechanism supporting innovative research:

- Total seed funding (2023-24): Rs. 289.5 lakhs
- Projects funded: 45 research initiatives
- Average grant per project: Rs. 2.4 lakhs
- Maximum grant: Rs. 10 lakhs for high-impact projects
- Funding cycles: Biannual evaluation and disbursement
- Success rate: 65% of submitted proposals funded

Research Areas Funded

- Artificial Intelligence and Machine Learning: 12 projects
- Sustainable Energy Technologies: 8 projects
- Advanced Materials Development: 7 projects
- Healthcare Engineering: 6 projects
- Smart Infrastructure: 5 projects
- Environmental Technologies: 7 projects

External Research Grants

External funding secured from government and industry:

- Total external grants: Rs. 43.8 crore
- Government agencies: DST, AICTE, UGC, DRDO
- Industry-sponsored research projects
- International collaborative research funding

- Departments with funded projects: 15 out of 17
- Active researchers with grants: 144 faculty members

Research Output and Publications

Comprehensive research productivity:

- Total publications (2023-24): 1625 papers
- SCI/SCOPUS indexed journals: 1220 publications
- Conference proceedings: 278 papers
- International collaborations: 127 joint publications
- Book chapters and edited volumes: 15 contributions
- Average citations per paper: 8.5 (increasing trend)

Intellectual Property Development

Patent filing and IP management:

- Patents filed (2023-24): 112 applications
- Patents granted: 22 approvals
- Technology domains: Electronics, Mechanical, Materials, Software, Biotechnology
- IPR Cell support: Application drafting, filing assistance, maintenance
- Industry licensing discussions: 8 patents under negotiation

PhD Program and Doctoral Research

Doctoral Research Infrastructure

Dedicated support for advanced research:

- Active PhD scholars: 124 researchers
- Recognized research guides: 176 faculty members
- PhD Cell administration under Dean of Research
- Comprehensive research facilities access
- Financial support: Fellowships and assistantships
- Research methodology courses and workshops

Research Quality Standards

Rigorous quality assurance mechanisms:

- Research Advisory Committee oversight
- Ethics Committee for human and animal research

- Plagiarism detection through authenticated software
- Progress monitoring: Six-monthly evaluations
- Publication requirements: Minimum two papers for degree
- Pre-submission seminars and peer review

Industry Collaboration and Technology Transfer

Memoranda of Understanding (MoUs)

Strategic partnerships with 25 organizations:

- IT and Software: TCS, Infosys, Cognizant, Wipro, IBM, Microsoft
- Manufacturing: L&T, BHEL, SAIL, Tata Steel
- Technology Giants: Amazon Web Services, Google Cloud
- Research Organizations: CSIR laboratories, DRDO
- Academic Institutions: IITs, NITs, international universities

Collaborative Research and Development

Joint projects and technology development (2,809 activities):

- Joint research projects: 145 collaborative investigations
- Technology development initiatives: 68 product innovations
- Sponsored research: 42 industry-funded projects
- Consultancy services: 85 technical problem-solving engagements
- Faculty exchange programs: 78 industry immersions
- Joint laboratories and facilities: 23 co-developed spaces

Technology Transfer and Commercialization

Bridging research to market:

- Technology licensing discussions: 8 patents
- Startup based on institute research: 35 ventures
- Industry adoption of research solutions: 18 implementations
- Consultancy & research grant: Rs. 43.8 crores
- Knowledge transfer workshops: 67 events
- Industry problem-solving competitions: 22 challenges

Sustainable Infrastructure Development

Green Energy Infrastructure

Renewable energy installations:

- Solar panel installations across rooftops
- Total solar capacity: 40 kW (estimated)
- Annual green energy generation: Significant contribution to campus needs
- LED lighting: Complete campus conversion
- Sensor-based energy conservation systems
- Energy-efficient HVAC systems in critical facilities

Water Management Infrastructure

Sustainable water systems:

- Rainwater harvesting: Multiple collection points
- Groundwater recharge systems: Borewell recharge pits
- Sewage treatment plant: Aerobic treatment technology
- Treated water reuse: Gardening and landscape irrigation
- Water body maintenance: Campus pond preservation
- Distribution system: Separate piping for treated water

Comprehensive waste handling:

- Solid waste segregation: Strategically placed bins
- Daily waste collection: NKDA partnership
- E-waste recycling: Partnership with Hulladek Recycling Pvt. Ltd.
- E-waste recycled (2023-24): 2057 kg
- Hazardous waste management: Laboratory safety protocols
- Recycling initiatives: Paper, plastic, metal segregation

Accessibility Infrastructure

- Ramps and lifts: Easy access to all floors
- Disabled-friendly washrooms: Multiple locations
- Tactile pathways: Navigation assistance
- Signage and display boards: Clear wayfinding
- Assistive technology: Screen readers, accessible website
- Human assistance: Support staff availability

Workshops and Capacity Building

Research Methodology and Innovation Workshops

Skill development for researchers (67 events during 2023-24):

- Research methodology workshops: 22 sessions
- Intellectual Property Rights (IPR) training: 15 programs
- Entrepreneurship development: 18 workshops
- Technical skill development: 12 specialized trainings
- Innovation challenges and hackathons: Multiple events throughout year

Faculty Development Programs

Professional capacity enhancement:

- Faculty Development Programs (FDPs): 43 organized
- Teachers attending FDPs: 127 participants
- Online and face-to-face formats available
- Professional development areas: Pedagogy, technology, research
- Certification programs: Industry-recognized credentials
- Administrative training: Leadership development

International Conferences

Knowledge dissemination platforms:

- International conferences organized: 44+ events
- Participant support: Complete registration fee reimbursement
- Faculty conference participation: 329 attendees
- Student presentation support: Travel and accommodation funding
- Global networking opportunities
- Publication in conference proceedings

Quality Assurance and Accreditation

Institutional Accreditation

Quality recognition and certification:

- NAAC accredited with A grade
- NBA accreditation: Multiple departments accredited
- Autonomous status: Granted January 2, 2019
- ISO certification for quality management
- NIRF ranking participation: Continuous improvement trajectory

- International ranking preparation: THE and QS applications planned

Internal Quality Assurance Cell (IQAC)

Systematic quality monitoring:

- Regular IQAC meetings and policy formulation
- Infrastructure assessment and improvement planning
- Academic and research quality evaluation
- Stakeholder feedback collection and analysis
- External audit facilitation
- Annual Quality Assurance Report (AQAR) preparation

Partnerships and Collaborations

Academic Partnerships

Research and knowledge exchange:

- Indian Institutes of Technology (IITs) for joint research
- National Institutes of Technology (NITs) for collaborative projects
- CSIR laboratories for advanced research facilities access
- DRDO for defense-related technology development
- International universities for faculty and student exchange
- Jadavpur University for research collaboration

Industry Partnerships

Technology development and transfer:

- TCS, Infosys, Cognizant, Wipro for IT research
- L&T, BHEL, Tata Steel for engineering collaborations
- IBM, Microsoft, Amazon, Google for emerging technology labs
- Manufacturing sector partnerships for product development
- Startup ecosystem collaborations with incubators and accelerators

Government Partnerships

Policy and funding support:

- DST (Department of Science and Technology) for research grants
- AICTE for infrastructure and innovation funding
- UGC for faculty development and research support

- MSME for entrepreneurship ecosystem development
- West Bengal government for state-level initiatives
- Startup India for entrepreneurship promotion

International Collaborations

Global research networks:

- International universities for joint research programs
- Technology transfer agreements with foreign institutions
- Student and faculty exchange programs
- Collaborative publications with international researchers
- Joint laboratory development initiatives
- Global conference participation and organization

Data and Metrics

Metric / Category	Value / Description
Centers of Excellence	23
Innovation and Entrepreneurship Development Centres	14
Startups Supported	198
Research Publications	1220
Patents Filed	112
Seed Funding for Research	Rs. 107.86 lakhs
External Research Grants	Rs. 43.8 crore
Faculty and Scholar Conference Participation	329 attendees
Joint Activities via MoUs	2,809
Student Internships	4,948 students
Sustainable Infrastructure Initiatives	Solar energy, rainwater harvesting, sewage treatment, e-waste recycling

Challenges and Mitigation Strategies

- Rapid technology obsolescence demands frequent infrastructure upgrades, requiring planned refresh cycles, strategic partnerships, and regular training.

- Research funding is challenged by dependency on uncertain external grants, mitigated by internal seed funds, diversified sources, consultancy revenue, and alumni support.

- Industry-academia collaboration gaps arise from misaligned research and product development timelines, addressed through joint planning, advisory boards, and dedicated liaison officers.

- Infrastructure maintenance faces high costs for sophisticated equipment, managed via annual maintenance contracts, in-house expertise, preventive upkeep, and equipment sharing.

- Sustainable infrastructure integration balances expansion with environmental concerns through green design, renewable energy use, water conservation, waste reduction, and life-cycle cost analysis.

Future Plans and Roadmap

- Establish 5 new Centers of Excellence and upgrade instrumentation and computing facilities with AI/ML capabilities.

- Expand Innovation and Entrepreneurship Development Centre capacity to support 350+ startups with increased seed funding.

- Target 700+ research publications, 20+ patents, and Rs. 5 crores in external research funding.

- Develop sustainable infrastructure by increasing solar capacity, achieving 100% LED lighting, implementing IoT energy management, and enhancing rainwater harvesting.

- Upgrade digital infrastructure with 5 GBPS bandwidth, WiFi 6 technology, advanced computing clusters, and virtual reality labs.

- Long-term vision includes establishing 50+ specialized labs, supporting 2,000+ startups, generating Rs. 100 crores through commercialization, achieving net-zero emissions, and building a global research network with 50+ international collaborations.

Photo Gallery

International Conference on Advancing Science and Technologies in Health Science (IEM-HEALS 2024) On September 13, 2024

International Conference on English Learning and Teaching Skills will be organized from 9th February 2024 to 11th February 2024.

3rd International Conference on Innovative Research Practices in Social Sciences (IRPSS-2023) in association with Smart Society, USA; ICRC-AIMA; Academy of Indian Marketing, scheduled on November 16, 17 & 18, 2023.

Workshop on the evolving Landscape of Pharmaceutical Marketing as we enter the Era of Biologics and Vaccines on 24th July 2024

Case & Research Wing of the Department of Management organized a research workshop on" Doing Qualitative Research" on November 16, 2023.

Workshop named SYTRON 2023 from 23rd September to 30th September 2023

IEEE Women in Engineering-WIE, Kolkata Section organized IEEE WIE Outreach Workshop on 31st August 2023 at IEM Public School Campus

Dept. of BBA & HRDC IEM organized an FDP on Python Essentials from 18th to 24th April 2024

5 Days Online International Faculty Development Program on "Quantum Artificial Intelligence" organized by Department of CSE-AIML and CSBS, IEM Kolkata from 24th June – 28th June , 2024

Faculty Development Program (FDP) on SMART AI & IoT from 27th to 31st May 2024

5 Days on FDP on "Advancing academia through AI exploring Opportunities, Challenges and Ethical Implications

One Week FDP on Recent Trends in High Frequency Communication and Next Generation Smart Systems 29th January 2024

Webinar on "5G Toolkit : An important tool for Research and Innovations in 5G and Beyond Technologies " by Gigayasa Wireless, IIT Madras 7th Feb 2024

"Discovering Yourself Through Web Development: A Beginner's Workshop"

IEEE IEM MTTS Student Branch Chapter organized an event Syntron on September 26th – 29th 2023

IEEE IEM MTTS Student Branch Chapter organized an event on 17th February 2024

ROBORASH organized by IEEE MTT-S, CASS, EDS, APS and WIE Student Branch Chapter from 23rd to 24th September 2023

VISCA 'EL' SYTRON (ROBOSOCCER) Organized by IEEE MTT-S, CASS, EDS, APS and WIE Student Branch Chapter from 23rd to 24th September 2023

SYTRONIX (COMPETITIVE CODING COMPETITION) organized by IEEE MTT-S, CASS, EDS, APS and WIE Student Branch Chapter on 30th September 2023

IEEE IEM EDS Student Chapter Branch hosted an engaging workshop on Electric Vehicle (EV) Technology on 7th of February 2024

IEEE IEM CAS-S Student Branch Chapter hosted an insightful lecture series on VLSI devices and systems On August 11, 2023

2 Day Workshop on MATLAB based Modern Control and Signal Processing Applications on 26th-27th of August, 2023

India's growth outreach accelerated linkage (goal) program on 23rd December 2023

Talk on Light from semiconductor on 14th March 2024

FDP Program on state-of-the-art techniques of Electrical and Electronic System integrating AI/ML from 28th November to 2nd Dec, 2023

FDP on "Quantum Enabled Science and Technology" (QuEST) on December 9-13, 2024

IEM-UEM Aeromodelling Workshop and Drone Exhibition on 13.10.2023

IEEE Instrumentation & Measurement Society, IEEE Joint CSS-IMS Kolkata Chapter & Department of Electrical Engineering, Institute of Engineering & Management, Salt Lake in association with IET (UK) Kolkata Local Network organized a talk by Professor Mihaela Albu, Professor of Electrical Engineering at the esteemed Politehnica, University of Bucharest, Romania

Short description of the event (100 to 150 words) IEEE IEM CASS Student Branch Chapter in association with IEEE CAS Kolkata Section , IEI and IEEE WIE affinity group organized a research talk on 5th February, 2024

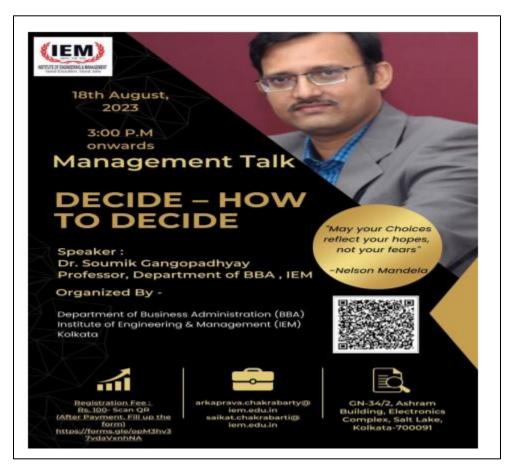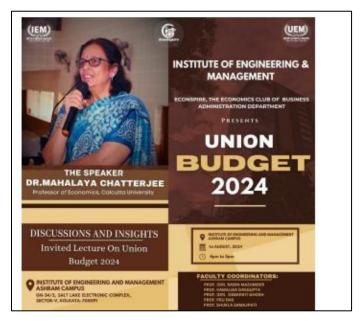*Workshop on IPR, Biosafety and Ethics on 13th January 2024*

Five-Day Faculty Development Program On Academic Social Responsibility and Best Pedagogical Practices Organized by Department of Basic Science and Humanities, Institute of Engineering and Management (IEM) in association with HRDC, IEM-UEM Group on 6th November 2023 – 10th November 2023

5 - Day Faculty Development Program Report on Unleashing Imagination: Delving into Generative AI and LLMs in Academia & Beyond organized by Department of Computer Application & Science in association with HRDC, IEM-UEM Group from 20th May 2024 – 24th May 2024
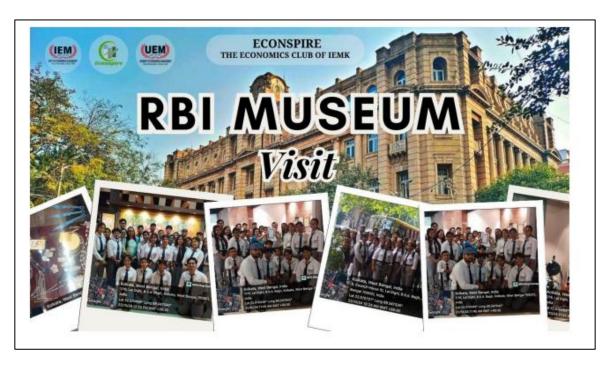
MDP ON 'DECIDE - HOW TO DECIDE' on 18.08.2023

Discussions and Insights on Union Budget 2024 by ECONSPIRE – The Economics Club on 1st August 2024

Two days Balancing Academics and Wellness Workshop on 8ᵗʰ and 9ᵗʰ February,2024

Industry Lecture Session on Strategic Difference in: Start-up, a profit earning organization, a sick industry to revive, in a small merger or acquisition on 24th September, 2024

RBI MUSEUM VISIT organized by Econspire, the Economics Club of IEM Ashram Campus, Kolkata, on Tuesday, 22nd October